

Original Research Article

Clinical profile and etiological spectrum of malignant pleural effusion: a hospital-based observational study

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ABSTRACT

Background: Malignant pleural effusion (MPE) is a common manifestation of advanced malignancy and is associated with significant morbidity. It results from direct or metastatic involvement of the pleura and often indicates poor prognosis. Aim of the study was to evaluate the clinical profile, etiological spectrum, and cytological characteristics of malignant pleural effusion.

Methods: This hospital-based observational study was conducted on 89 patients diagnosed with malignant pleural effusion from May 2012 to December 2014. Detailed clinical evaluation, radiological assessment, and pleural fluid analysis were performed. Effusions were classified using Light's criteria. Statistical analysis was performed using the Chi-square test with statistical package for the social sciences (SPSS) version 25.0. A p value of <0.05 was considered statistically significant.

Results: The mean age of patients was 59.06±15.53 years with a nearly equal gender distribution. The most common presenting symptom was cough (61.2%), followed by breathlessness (22.41%). Lung carcinoma was the most frequent primary malignancy (43.8%), followed by breast (15.7%) and ovarian malignancies (14.6%). Adenocarcinoma (28.1%) was the most common histopathological type. Pleural fluid cytology was positive for malignant cells in 68.5% of cases.

Conclusions: Malignant pleural effusion is most commonly associated with lung carcinoma and typically affects older adults. Pleural fluid cytology remains a crucial diagnostic tool for identifying malignant involvement of the pleura.

Keywords: Malignant pleural effusion, Lung carcinoma, Pleural cytology, Exudative effusion, Adenocarcinoma

INTRODUCTION

Pleural effusion is defined as the abnormal accumulation of fluid within the pleural cavity and represents a common clinical problem encountered in medical practice.¹ It can result from a wide variety of pathological conditions including infections, systemic diseases, and malignancies. Based on biochemical characteristics, pleural effusions are broadly classified into transudative and exudative types, most commonly using Light's criteria, which remains the standard method for differentiation.² Malignant pleural effusion (MPE) is an important cause of exudative pleural effusion and occurs due to involvement of the pleura by

malignant cells either through direct invasion or metastatic spread.³ It is frequently associated with advanced stages of malignancy and is considered a marker of poor prognosis.⁴ The accumulation of pleural fluid in malignancy is primarily due to increased vascular permeability, impaired lymphatic drainage, and tumor infiltration of pleural surfaces.⁵ Globally, lung carcinoma is the most common cause of malignant pleural effusion, particularly in males, whereas breast carcinoma is more commonly implicated in females.⁶ Other malignancies such as ovarian carcinoma, lymphomas, and gastrointestinal cancers may also contribute to pleural involvement. The clinical presentation of malignant pleural effusion is often nonspecific, with patients commonly presenting with

symptoms such as cough, breathlessness, chest pain, and occasionally fever.⁷ Pleural fluid analysis plays a crucial role in the diagnosis of malignant pleural effusion. Cytological examination of pleural fluid is a simple and minimally invasive diagnostic tool that can detect malignant cells in a significant proportion of cases.⁸ However, the diagnostic yield may vary depending on the type of malignancy and tumor burden.⁹ Understanding the clinical profile, etiological spectrum, and cytological characteristics of malignant pleural effusion is essential for early diagnosis and appropriate management. Hence, the present study was undertaken to evaluate these parameters in patients presenting with malignant pleural effusion in a hospital-based setting.

Aim and objectives

Aim of the study was to study the clinical profile and etiological spectrum of malignant pleural effusion.

Objectives of the study were: to identify the etiological causes of malignant pleural effusion, to analyze the clinical presentation of patients with malignant pleural effusion, and to evaluate the cytological characteristics of pleural fluid in malignant pleural effusion.

METHODS

Study design and setting

This was a hospital-based observational study conducted in the Department of Medicine at Government Medical College Jalna a tertiary care center from May 2012 to December 2014.

Study population

A total of 89 patients diagnosed with malignant pleural effusion were included in the study.

Inclusion criteria

Patients aged ≥ 18 years, with radiological evidence of pleural effusion, and confirmed diagnosis of malignancy were included.

Exclusion criteria

Patients with non-malignant pleural effusion, and patients with incomplete clinical or laboratory data were excluded.

RESULTS

A total of 89 patients with malignant pleural effusion were included in the study. The mean age of patients was 59.06 ± 15.53 years, indicating that malignant pleural effusion predominantly affects the elderly population. The male-to-female ratio was approximately 1.02:1, showing nearly equal gender distribution.

Clinical presentation

The most common presenting symptom was cough, observed in 61.2% of patients, followed by breathlessness in 22.41% of cases. Other symptoms included chest pain (13.79%) and fever (2.58%).

Symptoms

Tables for malignant pleural effusion study have been given (Tables 1 and 2, and Figures 1 and 2).

Cough was the most common presenting symptom, followed by breathlessness.

Lung carcinoma was the predominant primary malignancy.

The difference in distribution of primary malignancies was found to be statistically significant (Chi-square=61.8, df=6, $p < 0.001$).

Table 1: Clinical presentation of patients.

Symptom	Percentage (%)
Cough	61.2
Breathlessness	22.41
Chest pain	13.79
Fever	2.58

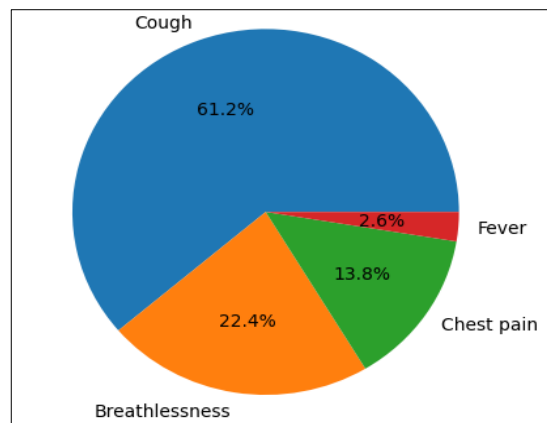


Figure 1: Clinical presentation of patients.

Table 2: Distribution according to primary site of malignancy.

Site	Number (N)	Percentage (%)
Lung	39	43.8
Breast	14	15.7
Ovary	13	14.6
Cervix	8	9.0
Lymphoma	7	7.9
Colon	7	7.9
Rectum	1	1.1
Total	89	100

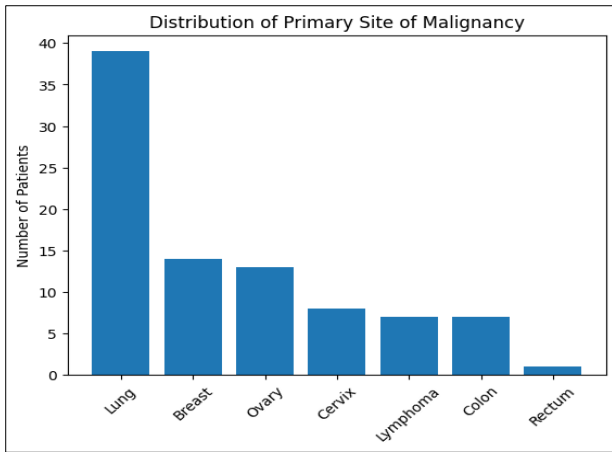


Figure 2: Distribution of primary site of malignancy.

Histopathological distribution

Among the histopathological types, adenocarcinoma was the most common, accounting for 28.1% of cases, followed by squamous cell carcinoma (22.5%). Other histological types included breast carcinoma (15.7%), papillary serous carcinoma (11.2%), small cell carcinoma (11.2%), Hodgkin lymphoma (5.6%), mucinous carcinoma (3.4%), and non-Hodgkin lymphoma (2.2%).

Additional tables for malignant pleural effusion study are given in Tables 3 and 4.

Table 3: Distribution according to histopathological diagnosis.

Diagnosis	Number (N)	Percentage (%)
Adenocarcinoma	25	28.1
Squamous cell carcinoma	20	22.5
Breast carcinoma	14	15.7
Papillary serous carcinoma	10	11.2
Small cell carcinoma	10	11.2
Hodgkin lymphoma	5	5.6
Mucinous carcinoma	3	3.4
Non-Hodgkin lymphoma	2	2.2

Table 4: Pleural fluid characteristics.

Characteristics	Percentage (%)
Hemorrhagic	50.56
Straw colored	49.43
Exudative nature	100

All pleural effusions in the present study were exudative in nature.

The appearance of pleural fluid was: hemorrhagic in 50.56% of cases, and straw colored in 49.43% of cases.

Cytological findings include pleural fluid cytology revealed malignant cells in 68.5% of patients, while 31.5% of cases were cytology negative.

Table 5: Demographic details.

Variables	Value
Total patients	89
Mean age (years)	59.06±15.53
Gender (male)	45 (50.5%) approx
Gender (female)	44 (49.5%) approx
Male: female ratio	1.02 : 1

DISCUSSION

MPE is a significant clinical entity that commonly reflects advanced-stage malignancy and is associated with considerable morbidity. In the present study, the majority of patients were above 50 years of age, with a mean age of 59.06±15.53 years, indicating that MPE predominantly affects the elderly population. This observation is consistent with previously published studies, which have reported a higher incidence of malignant pleural effusion in older individuals.¹⁰

The male-to-female ratio in our study was approximately 1.02:1, showing nearly equal gender distribution. Similar findings have been reported in other studies, suggesting that malignant pleural effusion does not show a significant gender predilection overall, although the underlying malignancy may differ between genders.

In the present study, cough (61.2%) was the most common presenting symptom, followed by breathlessness (22.41%). These findings are in agreement with earlier studies, where respiratory symptoms were the predominant clinical manifestations. The presence of cough and dyspnea can be attributed to pleural irritation, reduced lung expansion, and compression of lung parenchyma due to fluid accumulation. The most common primary site of malignancy in this study was the lung (43.8%), followed by breast (15.7%) and ovarian malignancies (14.6%). This is consistent with global data, where lung carcinoma is the leading cause of malignant pleural effusion, particularly in males, due to its proximity to the pleura and higher metastatic potential. Breast carcinoma remains a common cause in females. Histopathological analysis revealed that adenocarcinoma (28.1%) was the most common type, followed by squamous cell carcinoma (22.5%). Adenocarcinoma is known to have a higher propensity for pleural metastasis, which explains its predominance in malignant pleural effusion cases. These findings are comparable with previous studies reported in the literature.¹¹ In the present study, all pleural effusions were found to be exudative, which is expected in malignant conditions due to increased vascular permeability and impaired lymphatic drainage. The pleural fluid was hemorrhagic in 50.56% of cases, which is a characteristic feature often associated with

malignant involvement of the pleura. Pleural fluid cytology was positive for malignant cells in 68.5% of patients, which is consistent with earlier studies reporting a diagnostic yield ranging from 40% to 87%. This highlights the importance of cytological examination as a simple, minimally invasive, and effective diagnostic tool in the evaluation of malignant pleural effusion. The statistically significant difference observed in the distribution of primary malignancies ($p < 0.001$) further supports the predominance of certain cancers, particularly lung carcinoma, in the causation of malignant pleural effusion.

MPE is a significant clinical entity that commonly reflects advanced-stage malignancy and is associated with considerable morbidity and poor prognosis. In the present study, the majority of patients were above 50 years of age, with a mean age of 59.06 ± 15.53 years. This finding is consistent with previous studies, which have demonstrated that the incidence of malignant pleural effusion increases with advancing age due to higher prevalence of malignancies in the elderly population.¹⁰

The demographic profile in our study showed a nearly equal gender distribution (male: female ratio of 1.02:1). Similar observations have been reported in earlier studies, suggesting that while malignant pleural effusion itself does not show a strong gender bias, the underlying primary malignancies differ between males and females. Lung carcinoma remains more common in males, whereas breast and ovarian malignancies are more frequently observed in females.⁶

CONCLUSION

Malignant pleural effusion is a common manifestation of advanced malignancy and is predominantly seen in elderly patients. In the present study, lung carcinoma was identified as the most frequent underlying malignancy, followed by breast and ovarian cancers. Adenocarcinoma emerged as the most common histopathological subtype. Most patients presented with respiratory symptoms, particularly cough and breathlessness, and the pleural effusions were predominantly exudative in nature, with a significant proportion being hemorrhagic. Pleural fluid cytology demonstrated a high diagnostic yield and remains a simple, minimally invasive, and reliable method for confirming malignant involvement of the pleura. Early recognition and appropriate diagnostic evaluation of malignant pleural effusion are essential for timely management and improvement of patient quality of life.

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